EVALUATION OF THE AGRICULTURAL AND QUALITATIVE POTENTIAL OF THE NEW AUBERGINE GENOTYPE RO19VER22 ACHIEVED AT THE BUZAU PLANT GENETIC RESOURCES BANK

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RESEARCH ARTICLE

Abstract

Taking into account the increasing demands of farmers and consumers in terms of diversification of the assortment of aubergines marketed in Romanian markets, the Buzau Plant Genetic Resources Bank aims to contribute to its improvement by breeding and promoting new varieties, acclimatized to the growing conditions specific to our country. From the germplasm plots, the stable genotypes that passed the general and specific combining capacity test were subjected to hybridization work resulting in a large number of hybrids, of which the L R10V22 x L O58V22 combination was of interest for the breeding program.

As a result of the hybrid combinations, genotype A RO19VER22 was extracted, showing the following distinct and uniform fruit characteristics: fruit weight -590.35 g, fruit length -21.5 cm, obovate fruit shape, light green fruit color with slight striations, and greenish flesh, with an early ripening period. In the present research work, we have succeeded in stabilizing a new eggplant variety, with distinct phenotypic expressiveness, to be patented and approved under the aegis of the Buzau Plant Genetic Resources Bank.

Keywords: core collection, morphotypes, Romanian, Solanum melongena.
INTRODUCTION

The eggplant (Solanum melongena L.) is a fruit of major economic importance throughout the world, and is mainly grown in Asian subtropical regions (94% of world production), where its popularity has earned it the title of ‘the king of vegetables’ (Caruso et. all., 2017).

The Solanaceae family is one of the vegetable families with a high share in vegetable cultivation in Romania. Eggplant is a berry-producing vegetable belonging to the large family of Solanaceae, which has around 3000 different species distributed in across 90 genera (Kumar A., 2020). Regarding nutritional value, eggplant has a very low caloric value and is considered among the healthiest vegetables for its high content of vitamins, minerals and bioactive compounds for human health (Raigón et al., 2008).

Tomatoes, potatoes, peppers and aubergines are among the vegetables frequently grown by both small and large farmers. In Romania it was propagated by Greek and Bulgarian gardeners in the 18th century and it became widespread after the First World War.

The most important growing areas of eggplant are located in the Southern, South-Eastern and South-Western part of Romania (Kovacs et. all., 2020). In Romania, aubergine production was 74,040 tonnes, harvested from an area of 4,710 ha (FAOSTAT, 2020), a low production compared to that of the largest aubergine producer - China (Frary A. et all., 2007) which recorded a production of 36,593,884 tonnes on an area of 790,658 ha (FAOSTAT, 2020).

The Buzau Plant Genetic Resources Bank has an important collection of aubergines at different stages of breeding.

MATERIALS AND METHODS

The present research involved the germplasm collection held by PGRB Buzau for this species. So far, the unit has a collection composed of 343 genotypes, structured in terms of genetic stability, as follows: 84 genetically stabilized genotypes, 114 genetically advanced genotypes, 145 segregating genotypes.

Phenological observations, biometric measurements and laboratory analyses were carried out throughout the growing season. Measurements of genotypes during the growing season were made according to the observation sheet made in accordance with the UPOV and IGPRI descriptors (Figure 1), which includes a total of 47 observations, with particular emphasis on observations of stable useful phenotypic expression in the progeny.

Statistical analyses were performed using SPSS software.

Stable genotypes were subjected to intensive multi-stage breeding work. In the first stage, testing of overall combining ability was evaluated, using varieties from the collection as test parents: Bucurestene, Danubiana, Pana Corbului and Romanița. To maintain the authenticity of the parents, the conservative selection scheme specific to Solanum melongena was used, and for testing the general and specific combining ability, simple hybridization was used. The culture technology applied was the species-specific framework technology and the care works were the usual ones. The cropping pattern applied was 40 cm between plants per row and 70 cm distance between rows. The seedlings were produced in alveolar pallets in the greenhouse without technological heating. Seeding age at planting was about 60 days.

![Figure 1. (a) PGRB Buzău aubergine germplasm collection; (b) Fruit description framework chart](image-url)
The 84 genetically stabilized parents were involved in the testing of the general combining ability, resulting in a total of 162 hybrid combinations after evaluation of the traits of interest for hybridization. Of these, 36 parents demonstrated genetic availability for hybridization and were involved in the process of testing specific combining ability, resulting in a total of 83 hybrid combinations, of which the combination L R10V22 x L O58V22 showed interest in breeding new valuable genetic resources (Figure 2).

**RESULTS AND DISCUSSIONS**

The parents used in the hybrid combination are varieties approved and patented in the Official Catalogue of the Romanian Cultivated Plants. As maternal line was used Romanița variety which was taken in study for stabilization of characters over 20 years, and as paternal line was used Iarina variety, which was subjected to breeding studies for a period of about 13 years.

The Romanița variety, approved in 2019, stands out for being the first commercial variety of white eggplant, which is highly appreciated among traditional vegetable growers in Romania.

The main characteristics of Romanița variety for field culture are represented by the globular shape of the bush, light green color of the plant without traces of anthocyanins on the plant organs, a height of 96 cm, plant diameter 86 cm, leaf width 29 cm, leaf width 23 cm. Sepals are light green in colour, show spikes but are not aggressive. The flower is light purple.
The fruit weighs between 495 g and 882 g, with an obovate-pyriform shape. The pleasant commercial appearance is conferred by the white colour and the intense shine of the fruit. The flesh is butter-white in colour, with a fine texture that becomes creamy during cooking (Figure 3).

The seeds are clustered in the apical part of the fruit, a characteristic much appreciated by consumers. Harvest ripeness is represented by the glossy white colour of the fruit.

![Figure 3](image)

**Figure 3.** Romanița genotype aspects: (a) flower, (b) calyx, (c) fruit, (d) buttery-white flesh

The Iarina variety approved in 2021 is distinguished by the light green colour of the club shaped fruit (Figure 4). The characteristics of the open field variety are: globular shape of the bush, green colour of the plant, no traces of anthocyanins. The height of the plant is 82 cm, the diameter 58 cm, it has peristyles on the sepals, the colour of the flowers is light purple. The fruit is light green, medium gloss.

Average fruit length is 23 cm with an average diameter of 4.05 cm. The average fruit weight is 265 g and the seed dispersion is at the base of the fruit and slightly in the fruit. It is noted for the nutty aroma of the fruit when thermally prepared.

![Figure 4](image)

**Figure 4.** Iarina genotype aspects: (a) flower, (b) calyx, (c) fruit, (d) white-green flesh

From the hybrid combination it was found that in F1 a hybrid generation was achieved, uneven both in terms of the expressiveness of the main characters and in terms of the intensity of the heterosis phenomenon.

A total of 8 parents with distinct phenotypic expressivity were obtained in F1 which together (L31 (3%), A18 (5%), L54 (5%), L47 (6%), L67 (7%), L20 (3%), A93 (4%), A19 (15%)) represent a total of 48%.

It should be noted that the resulting forms in the 48%-100% range were intermediate forms that were eliminated. These lines were subjected to improvement work, stabilizing in F6- A RO19VER22; F7- L67, L54, L20; F8- L 47; F9- A93; F10- A18; F11- L31.

The main characteristics of the stabilized genotypes are given by fruit shape and appearance (Table 1).

**Table 1.** Main fruit characteristics for the stabilized genotypes

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Fruit weight (g)</th>
<th>Fruit length (cm)</th>
<th>Canopy width (cm)</th>
<th>Blossom-end</th>
<th>Fruit apex</th>
<th>Fruit color</th>
<th>Calyx (cm)</th>
<th>Sepals no.</th>
<th>Sepals length (cm)</th>
<th>Thorns on calyx</th>
<th>Flesh color</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 20</td>
<td>27</td>
<td>2,41</td>
<td>4,6</td>
<td>irregular</td>
<td>indented</td>
<td>white</td>
<td>1,6</td>
<td>5</td>
<td>0,88</td>
<td>weak</td>
<td>whitish</td>
</tr>
<tr>
<td>L 67</td>
<td>316</td>
<td>19,4</td>
<td>5,91</td>
<td>linear</td>
<td>indented</td>
<td>white</td>
<td>3,86</td>
<td>6</td>
<td>4,35</td>
<td>medium</td>
<td>whitish</td>
</tr>
<tr>
<td>L 47</td>
<td>215</td>
<td>14,88</td>
<td>6,03</td>
<td>circular</td>
<td>rounded</td>
<td>green</td>
<td>2,81</td>
<td>7</td>
<td>2,38</td>
<td>absent</td>
<td>whitish</td>
</tr>
<tr>
<td>A 93</td>
<td>186</td>
<td>14,8</td>
<td>5,11</td>
<td>circular</td>
<td>indented</td>
<td>white</td>
<td>3,16</td>
<td>6</td>
<td>3,61</td>
<td>medium</td>
<td>greenish</td>
</tr>
<tr>
<td>A 18</td>
<td>526</td>
<td>12,73</td>
<td>10,92</td>
<td>circular</td>
<td>rounded</td>
<td>white</td>
<td>5,12</td>
<td>7</td>
<td>4,96</td>
<td>medium</td>
<td>whitish</td>
</tr>
<tr>
<td>L 54</td>
<td>295</td>
<td>14,7</td>
<td>5,26</td>
<td>circular</td>
<td>flattened</td>
<td>white</td>
<td>3,31</td>
<td>6</td>
<td>3,34</td>
<td>weak</td>
<td>whitish</td>
</tr>
<tr>
<td>L 31</td>
<td>115</td>
<td>6,88</td>
<td>6,03</td>
<td>circular</td>
<td>rounded</td>
<td>white</td>
<td>2,81</td>
<td>5</td>
<td>2,38</td>
<td>absenta</td>
<td>whitish</td>
</tr>
</tbody>
</table>
The genotype that presented interest both for its morphological qualities and for its resistance to attack by the main pathogens and stability in progeny was genotype A RO19VER22. The evolution of the typical forms of genotype A RO19VER22 showed linearity in the progeny, progressively increasing from F1 by 15%....F3-33.4% until F6 when a percentage of 100% typical, genetically stable plants was recorded (Figure 5).

![Figure 5. Typical forms of A RO19VER22 evolution](image)

It is distinguished by the special light green colour of the fruit, and the bright green colour of the plant. It is characterized by a vigorous, strongly developed plant habit, branched in 3 shoots, the height of the plant is 82 cm and the diameter of the bush is 51 cm. There are no leaf sheaths, they are present on the veins and sepals. The leaves are large, with an average length of 26.25 cm and a width of 18.75 cm. The adaxial leaf color is green and the abaxial leaf color is light green, with slight traces of anthocyanins on the leaf veins and peduncle. The peduncle has an average length of 11.85 cm and a diameter of 6.80 cm. The leaf is corrugated with wavy edges. The flower has aggressive spikes on the sepals, the flower is light purple, the flower diameter is 4.44 cm and the pedicel length is 2.84 cm.

The main characteristics of the fruit are shown in Table 2. It is characterized by obovate fruit shape, pistil point of 5.29 mm, fruit tip is indented, fruit colour at harvest maturity is light green without spots and streaks, weak anthocyanin colouring under calyx, presence of spines on calyx is strong, physiological ripening time is early. The colour of the fruit turns orange at physiological ripening and the seeds are located in the apical half of the fruit (Figure 6).
As can be seen in Table 2, genotype A RO19VER22 showed uniformity in terms of trait stability in progeny.

<table>
<thead>
<tr>
<th>Year</th>
<th>Fruit weight</th>
<th>Fruit length</th>
<th>Fruit width</th>
<th>Calyx diam.</th>
<th>Sepals no.</th>
<th>Sepals length</th>
<th>Peduncle length</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>583.81±6.16*</td>
<td>21.66±0.46*</td>
<td>7.29±0.799</td>
<td>5.86±0.62*</td>
<td>5.4±0.45*</td>
<td>6.80±0.2*</td>
<td>5.93±0.6*</td>
</tr>
<tr>
<td>2021</td>
<td>585.44±8.63*</td>
<td>21.58±0.56*</td>
<td>7.27±0.72*</td>
<td>5.85±0.41*</td>
<td>5.60±0.49*</td>
<td>6.96±0.46*</td>
<td>6.76±0.62*</td>
</tr>
</tbody>
</table>

The research has been completed so far with the consolidation of the germplasm collection held by PGRB Buzau.

The intensive breeding works to which the genotypes in the collection have been subjected have led to a good knowledge of their general and specific combinatorial capacity, and at the same time new genotypes with distinct phenotypic expressiveness have been obtained. From the hybrid combination L O58V22 x L R10V22, 8 parents were stabilized, among which the genotype A RO19VER2022 stood out for its high yield potential, genetic resistance to the attack of the main pathogens and distinct fruit colour.

The feedback obtained from the promotional distribution of seeds and seedlings during 2019-2022 was positive, being appreciated primarily for taste, aroma, flesh.

For the newly created genotype the necessary documentation for patenting and approval by ISTIS Romania has been prepared.

Author Contributions: Please specify the individual contributions of every author if there are several. Ex.: A.B. Conceived and designed the analysis; C.D. Collected the data; E.F. Contributed data or analysis tools; G.H. Performed the analysis; I.J. Wrote the paper. You can add other contributions if necessary.

Conflicts of Interest
The authors declare that they do not have any conflict of interest.

REFERENCES


13. [https://doi.org/10.24154/JHS.2019.v14i01.004](https://doi.org/10.24154/JHS.2019.v14i01.004)
